

BLOCK SHEAR EXAMPLE

ORIGINAL STRENGTH:

$$\phi P_n = 0.9 \times (1/4) (10") \times 50" = 112.5 \text{ k}$$

NEW STRENGTH =

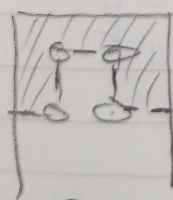
YIELD:

$$\phi P_n = 0.9 \times (1/2) (10") (50 \text{ ksi}) = 225 \text{ k}$$

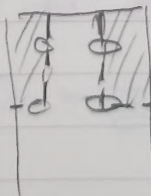
FRACTURE:

$$\phi P_n = 0.75 (1/2) (10 - 2 \times (3/8 + 1/8)) \times 65 = 219 \text{ k}$$

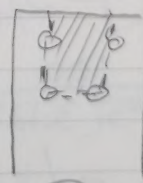
BLOCK SHEAR



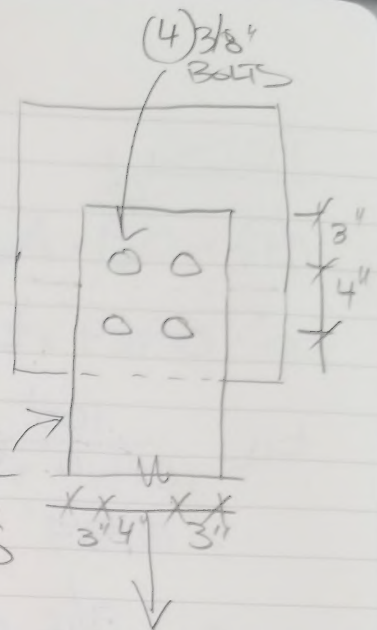
①



②



③



$$\text{Mode (1)} \quad \phi R_n = \phi [0.6 F_u A_{nv} + U_{bs} F_u A_{nt}]$$

$$\leq \phi [0.6 F_y A_{gv} + U_{bs} F_u A_{nt}]$$

$$F_y = 50 \quad F_u = 65$$

$$A_{nv} = 2 \times (4 - 3/8 - 1/8) (1/2) = 3.5 \text{ in}^2$$

$$A_{nt} = (10 - 2(3/8 + 1/8)) (1/2) = 4.5 \text{ in}^2$$

$$A_{gv} = 2(4) (1/2) = 4 \text{ in}^2$$

UNIFORM

$$R_n = 0.6 \times 65 \times 3.5 + 1.0 \times 65 \times 4.5 = 469$$

$$\leq 0.6(50)(4) + (1.0)(65)(4.5) = 413$$

$$\phi R_n = 0.75 \times 413^k = \underline{\underline{309^k}}$$

Mode (2)

$$A_{nv} = 2 \times (7 - 1.5 \times (3/8 + 1/8)) \times 1/2 = 6.25$$

$$A_{nt} = 2 \times (3 - 1/2 \times (3/8 + 1/8)) \times 1/2 = 2.75 \text{ in}^2$$

$$A_{gv} = 2 \times 7 \times 1/2 = 7 \text{ in}^2$$

$$R_n = 0.6 \times 65 \times 6.25 + 1.0 \times 65 \times 2.75 = 423^k$$

$$\leq 0.6 \times 50 \times 7 + 1.0 \times 65 \times 2.75 = 389$$

$$\phi R_n = 0.75 \times 389 = \underline{\underline{291^k}}$$

MODE (3)

$$A_{nv} = 6.25 \text{ in}^2 \text{ (SAME AS MODE @)}$$

$$A_{nt} = (4 - 3/8 - 1/8) (1/2) = 1.75 \text{ in}^2$$

$$A_{gv} = 7 \text{ in}^2 \text{ (SAME AS MODE @)}$$

$$\phi R_n = 0.75 \times 304 = \underline{\underline{228 \text{ k}}} \text{ GOVERNS}$$

FOR BLOCK
SHEAR

BUT!

219 k GOVERNS OVERALL
(FRACTURE)

SINCE $219 \text{ k} > 12.5 \text{ k}$, PLATE OK!
(ORIGINAL STRENGTH)